

Cautionary and Warning Statements

- This kit is designed and intended for educational purposes only.
- Use only under the direct supervision of an adult who has read and understood the instructions provided in this user guide.
- Read warnings on packaging and in manual carefully.

Included Materials

- 2 basswood sheets of laser-cut parts
- 2 screws
- Paper clip
- 7 dowels of varying lengths
- String
- Washer
- 4 caps

Items Required (not included)

- White glue such as HD Bond
- Small Phillips screwdriver
- Needle-nose pliers (optional)
- Scissors
- Tissues (to wipe glue – optional)
- Hobby knife (optional)
- Waxed paper (optional)

Introduction

The Crane Kit uses a combination of simple machines – levers, pulleys, and wheels and axles – to raise, lower, and turn a load. Both simple and complex cranes are used worldwide to make moving items easier. Cranes are vital for construction, loading boats or trailers, moving metal scrap, and other industrial activities.

Building Tips

- If the dowels do not fit into their holes, ream out the holes a bit with a hobby knife.
- Be careful not to use too much glue, which might make parts not fit together correctly. Wipe off any excess with a facial tissue. Place a sheet of waxed paper on your work surface to keep it clean of glue.
- Let parts dry for 15 minutes after gluing.

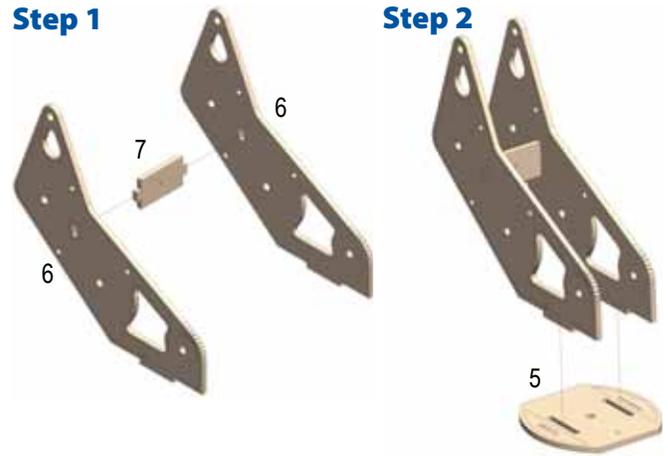
Building the Base

1. Carefully, remove the laser-cut parts from the basswood sheets. On some parts, there might be some areas that need to be removed.
2. With the number on Part 1 facedown, glue the Part 2s into Part 1.
3. Glue a Part 3 on the end of each Part 2. Then, glue one Part 4 in the round space in the middle of the Part 2s. After the assembly dries, turn it over.



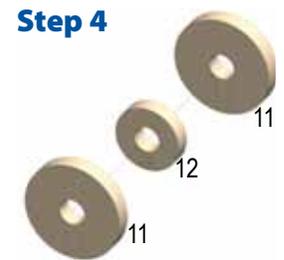
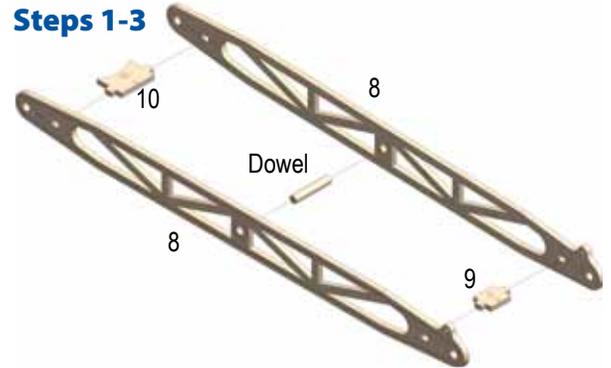
Building the House (chassis)

1. Holding the two Part 6s parallel so the numbers face out, glue Part 7 between the Part 6s in the rectangular holes.
2. Glue the Parts 6 and 7 onto Part 5 – the wide notches on one end of the Part 6s fit into the rectangular slots on Part 5. Be sure to apply glue along the edges beside the notches.



Building the Boom (arm)

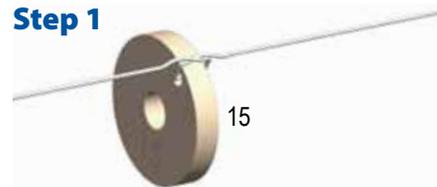
1. Lay out Parts 8, 9, and 10 as shown (the dowel that will be added in Step 3 is shown to help with placement). Note that the arrows on Parts 9 and 10 are both pointing up. Glue Parts 9 and 10 into one Part 8.
2. Apply glue to the other sides of Parts 9 and 10 and place the other Part 8 on top. The boom will be narrower at one end.
3. Take one of the shortest dowels and glue it between the Part 8s in the holes in the middle of the boom.
4. Align and glue together two Part 11s with one Part 12 between them as shown. Be sure not to get glue in the hole so a dowel will fit through. Repeat this with two more Part 11s and the other Part 12. This will make two pulleys.
5. Use a short dowel to connect one of the pulleys to the end of the boom that has Part 9. Apply glue to the ends of the dowel to secure it to the boom. Let it dry. The other pulley will be used later.



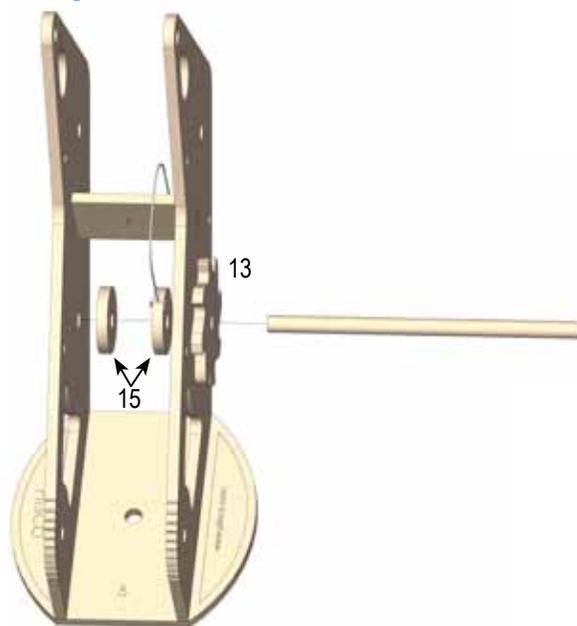
Putting Together the Parts

1. Cut the string in half. Tie each half to one Part 15 through the small hole near the edge of the piece. (Two Part 15s will not have a string.) Leave most of the string on one side and securely knot the string. Apply a dab of glue on the knot.
2. Place a Part 13 on one of the long dowels. Push the dowel through the hole near the middle of the chassis' Part 6 that does not have degree marks. Make sure the points on Part 13 point counterclockwise (the part number will not be visible). Place a Part 15 with the string on the dowel between the Part 6s and then place a Part 15 that does not have string. Then, push the dowel through the other side of the house. Make sure one inch of the dowel extends from each side of the house.
3. Glue the Part 15s onto the dowel about 1/4" from the sides of the house. To do this, slide each Part 15 just to the side of where they should be glued and apply glue there. Then, slide the parts over the glue – be sure not to glue the string. These parts form a drum.
4. Repeat Steps 2 and 3 with the second long dowel, Part 13, and Part 15s, but place them through the holes just above where Part 7 is located.

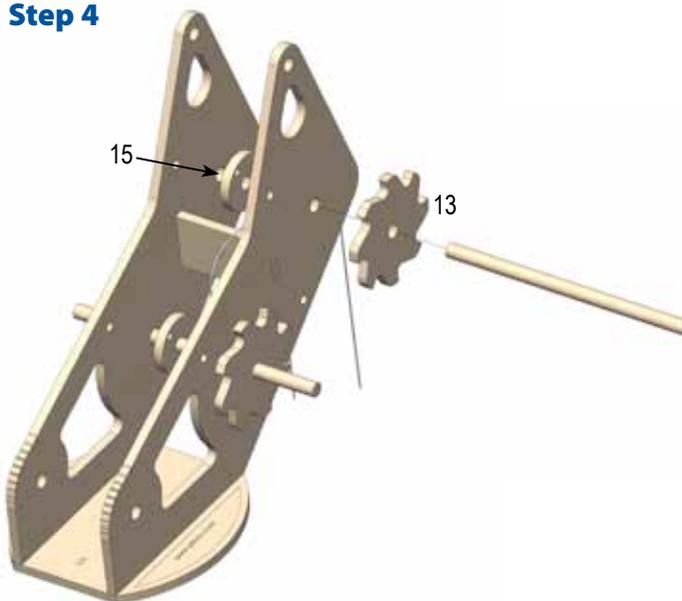
Step 1



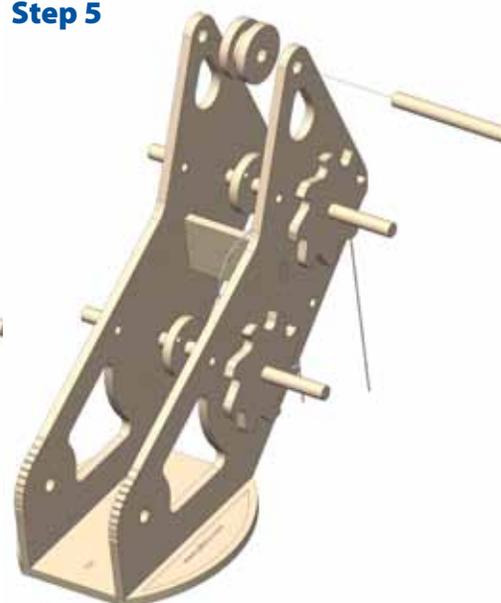
Steps 2-3



Step 4



Step 5



5. Run one of the medium dowels through one side of the hole at the top of the crane house assembly. Place the second pulley between the two sides of the house and push the dowel through it. Push the dowel through the other side of the house. Apply glue to the outside ends of the dowel.

6. Align a Part 14 to the hole above one of the Part 13s; place a screw through the hole. Tighten the screw enough to secure the part to the house, but not so tight that it won't turn. This makes the first drum catch.

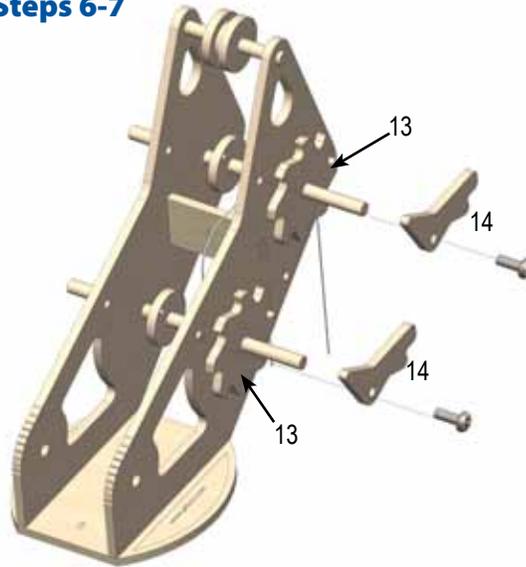
7. Repeat Step 6 with the other Part 14 and the hole above the second Part 13. This makes the second drum catch.

8. Take the last short dowel and place it down the middle hole in the base. Place the house so the bottom of it is resting on top of Part 1 of the base. Place a Part 4 on the dowel on top of Part 5 and the last Part 4 on the dowel on the underside of the base. Glue the ends of the dowel that are just protruding from the Part 4 pieces.

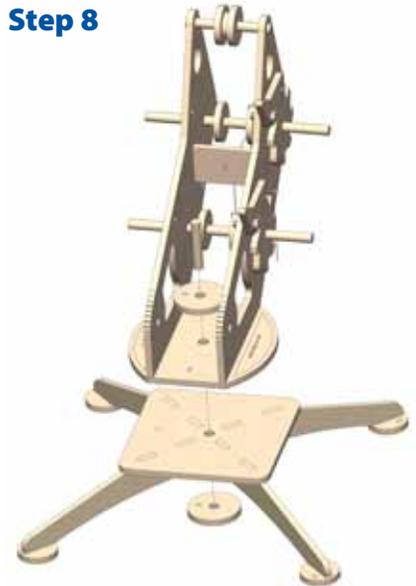
9. Align the holes in the wide end of the boom to the holes near the bottom of the house. Make sure the boom is placed so the small holes beside the pulley point toward the house. Run the last dowel through the boom and house to join the two assemblies. Place a dab of glue on each dowel end and let it dry.

10. Take the string attached to the bottom drum and run it down the length of the boom and over the pulley at the end of the boom. Now, turn the drum in the direction away from the boom a few times to start winding the string. Push the drum catch down so it holds the drum in place. Place a cap over each end of the two long dowels that hold the drums in the house.

Steps 6-7



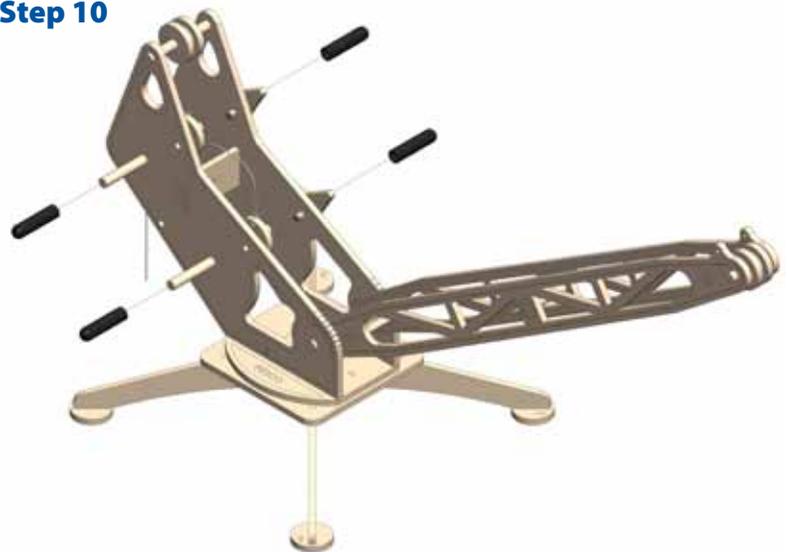
Step 8



Step 9

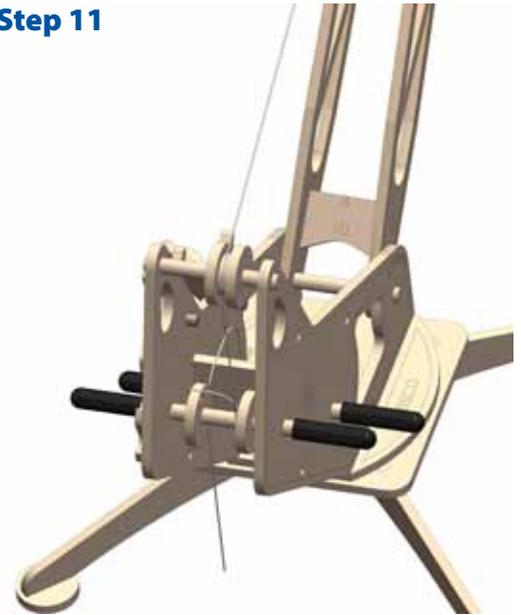


Step 10



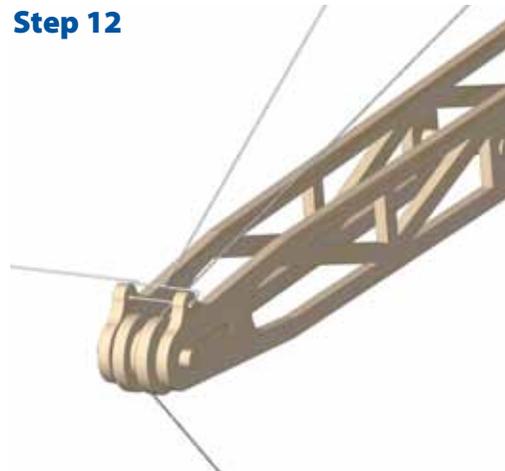
11. Take the string from the top drum and run it behind and over the pulley at the top of the house.
12. Pull the string all the way out. Take the loose end of the string and loop it through the two holes at the end of the boom. Make sure not to pull too much string through the other end – just enough to tie a knot. Tie the knot tightly. Turn the top drum away from the boom to take up the slack. When the boom is in position, push the drum catch down to hold it in place.
13. Bend the paper clip so the loop ends are bent away from each other. If available, use the needle-nose pliers to do this.
14. Take the loose end of the string attached to the bottom drum. Knot the string around the narrow end of the paper clip. Apply a small dab of glue on the knot to hold it. You can pinch the narrow end of the paper clip together to hold the string in place.

Step 11



15. When the glue is dry, place the washer over the paper clip loop so it hangs from the paper clip. Adjust the string lengths by turning the drums.

Step 12



Step 15



Operating Your Kit

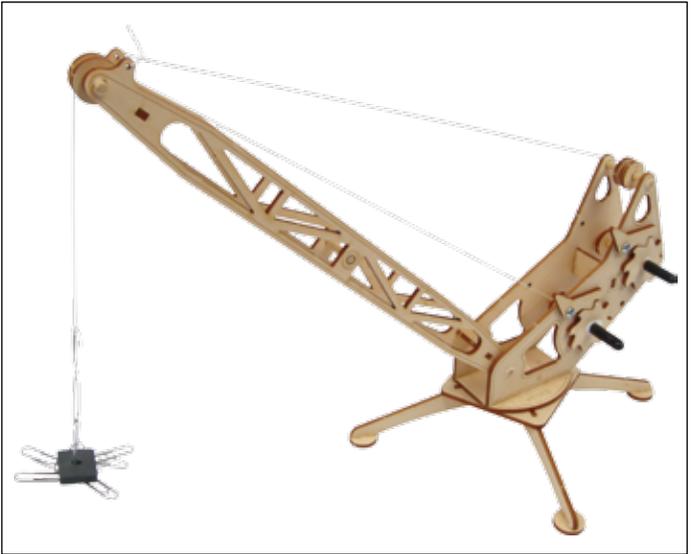
Turn the drums in the direction away from the boom. Turning the bottom drum will shorten the length of the washer string. Turning the top drum will bring up the boom. When you stop turning the drums, be sure the drum catches are in place to keep the drums from unwinding.

To release some of the string to lower the boom or the washer, pull back the drum catch and unwind the string as much as desired. The house also turns on its base. The washer acts as a small load or a wrecking ball.



Activity Ideas

- As an alternative to the washer load/wrecking ball, you could try using a magnet. Using another paper clip and the needle-nose pliers, bend the paper clip to secure a small ceramic magnet and to form a small hook. Place the magnet hook over the paper clip on the crane's string.
- Research how to make an electromagnet to make a crane like those at metal recycling centers. Try to make an electromagnet that could be used on the end of the crane to let you to pick up metal items with the magnet and then release them where needed.



Activity Tip: If you alter the crane or its load so the crane is off balance and tipping over, add ballast to the back of the crane. To do this, simply hang a weighted object from the two holes (one on each Part 6) on the back of the crane house. Make sure the ballast doesn't interfere with the operation of the crane.



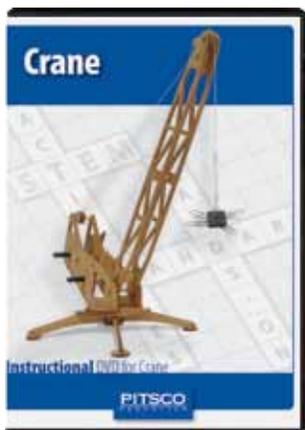
Other STEM projects for the classroom!

Students love these activities – giving you the opportunity to teach simple machines, energy, trajectory, and more in an unforgettable way!

To learn more about Pitsco Education's kits, visit shop.pitsco.com or call 800-835-0686.

CRANE VIDEO

A crane is a complex machine made of three simple machines, but building the Crane Kit isn't complex at all when following this step-by-step program. As you build, learn about the various simple machines and the uses of cranes around the world. Then, try replacing the crane's hook with a magnet or balancing the crane with a ballast.



34126 DVD

CATAPULT KIT

Feeling some tension? Perfect! For the medieval catapult, stored tension equals the power of projectile motion – which now equals awesome learning power!

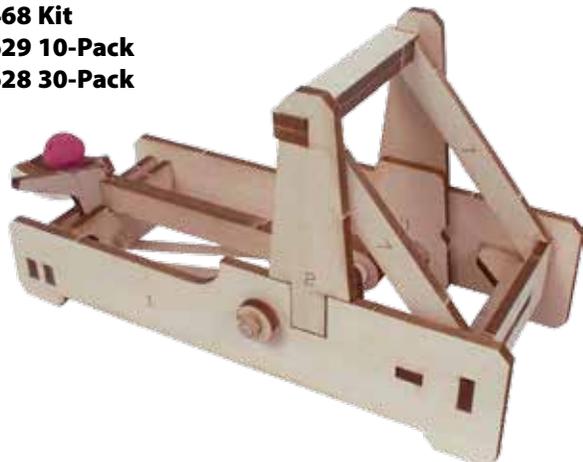
Build and use this snappy kit to demonstrate:

- Forces and motion
- Vectors
- Trajectory
- Potential and kinetic energy
- Simple machines
- Medieval history

Plus, students can further develop math, physics, and problem-solving skills by experimenting with the catapult to reach different distances with varying weights of ammunition (pieces of clay). Going back to the dark ages has never been so enlightening!

Clay included.

59468 Kit
35629 10-Pack
35628 30-Pack



TREBUCHET KIT

With the Pitsco *Trebuchet Kit*, you'll be experiencing the thrill of flinging projectiles like those medieval machines, but focusing on height, velocity, and distance rather than on knocking down the enemy's fortress.

Students can alter characteristics of the trebuchet – the mass of the clay, the string length, or the amount of the counterweight – and can see how the results are affected. Students also see these concepts in action: levers, inertia, counterweights, friction, and more.

The kit is great for small groups of students and includes all materials for construction including a punch-out basswood body plate, supplies for the catapult sling, and pieces for the launcher arm. Mass plates sold separately (see below).

26635
35634 10-Pack
27013 25-Pack



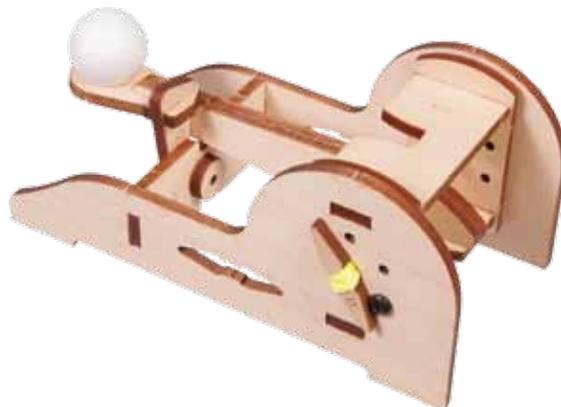
MASS PLATES
58676 (PKG OF 20)

TORSION CATAPULT KIT

At last, a catapult kit that uses the same power source as the ancient and medieval catapults – torsion! By twisting the strings holding the launch arm, students can launch small projectiles with this fun siege machine. Plus, it's great for helping students understand how to apply torque, potential and kinetic energy, projectile motion, and more.

The kit features laser-cut basswood parts and the string and hardware needed to build the catapult. Requires a small screwdriver, white glue, and scissors, sold separately.

37521 Kit
37965 10-Pack



Crane Kit



User Guide

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